2023 COASTAL MASTER PLAN
COMMITTED TO OUR COAST

RISK ASSESSMENT
RISK MODEL IMPROVEMENTS

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OVERVIEW

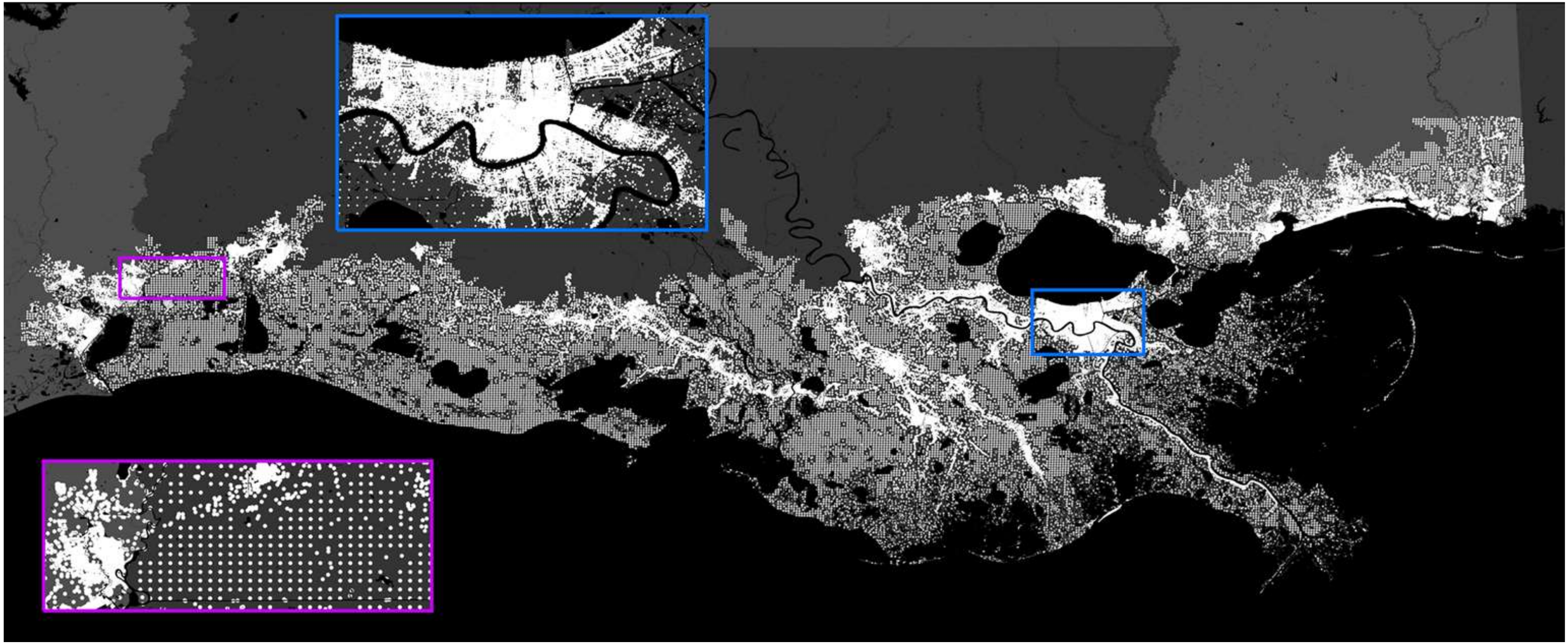
RISK MODEL UPDATES

- Spatial Domain and Resolution
- Structure Inventory
- JPM-OS Methodology
- System Fragility
- Population and Asset Growth

SPATIAL DOMAIN

SPATIAL DOMAIN AND RESOLUTION

OVERVIEW



- 2017 model: 118,719 grid points
- 2023 model includes **126,174 grid points** (~112,000 in Louisiana) and associated polygons

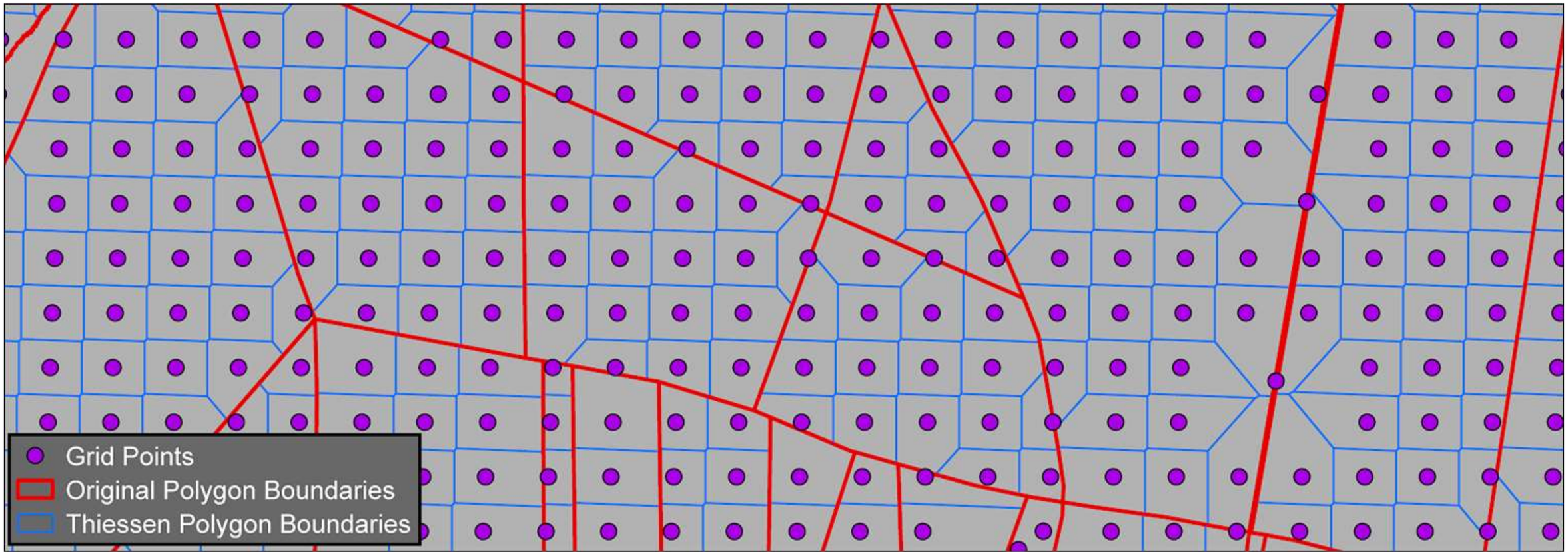
SPATIAL DOMAIN AND RESOLUTION

MODEL POLYGON AND POINT WORKFLOW

- Starts with 2010 census block boundaries
- Regularly-spaced grid cells in larger census blocks (1-km spacing)
  - Smaller blocks left as single grid cells
- Further subdivided by
  - Existing protection system and proposed project centerlines
  - ICM compartments
  - Weir void zones from ADCIRC mesh
  - Community boundaries
- Surge and wave behavior sampled at polygon centroids for most cells
  - Adjustment for structure-level risk modeling

SPATIAL DOMAIN AND RESOLUTION

SPLITTING POLYGONS CONTAINING MULTIPLE GRID POINTS

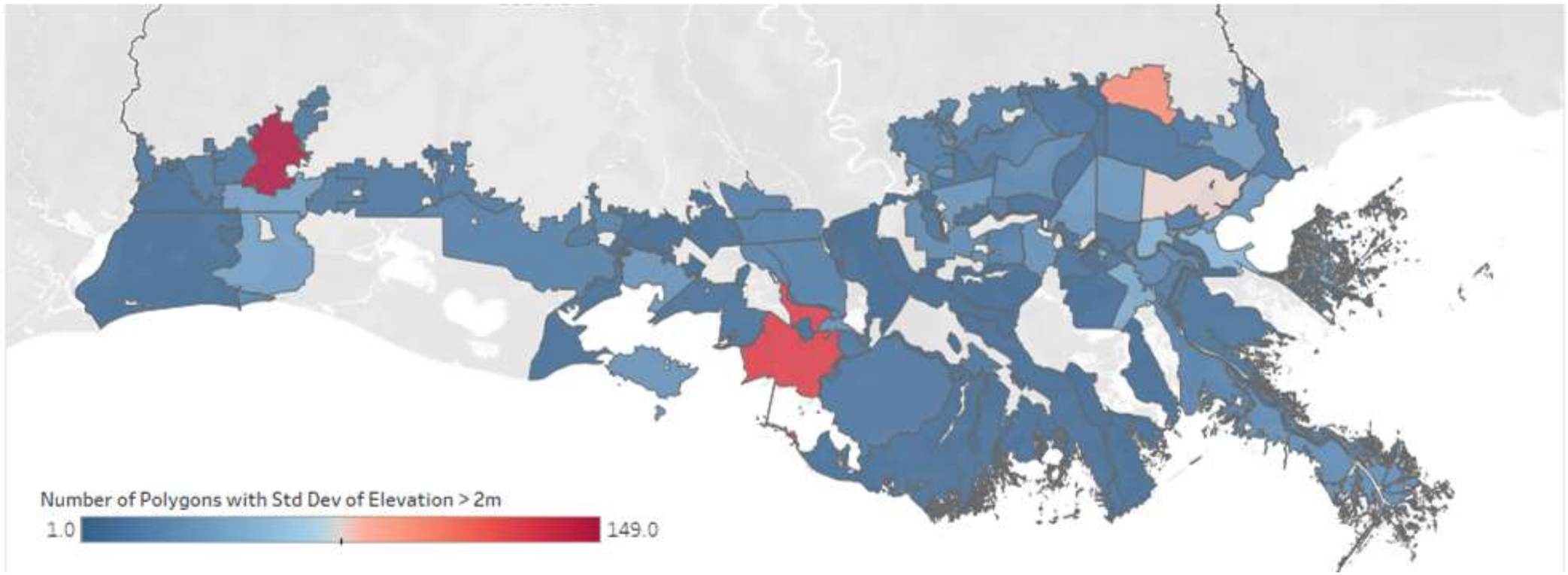


Splitting polygons containing multiple grid points into Thiessen polygons

SPATIAL DOMAIN AND RESOLUTION

GROUND ELEVATION CALCULATION UPDATES

- Ground elevation for flood depth calculations
  - 2017 ground elevation: grid point location
  - 2023: median topographic elevation over all land pixels



Comparison of median polygon ground elevation to 2017 grid point elevation

ELEVATIONS FOR DAMAGE MODELING

ELEVATION CALCULATION UPDATES

- CLARA previously applied flood depths at grid point locations for all risk calculations within the associated grid cell
- New approach:
  - Calculate surge elevation and wave height exceedances at grid point locations
  - For each structural asset, convert to flood depth exceedances using topographic elevation at the structure's location

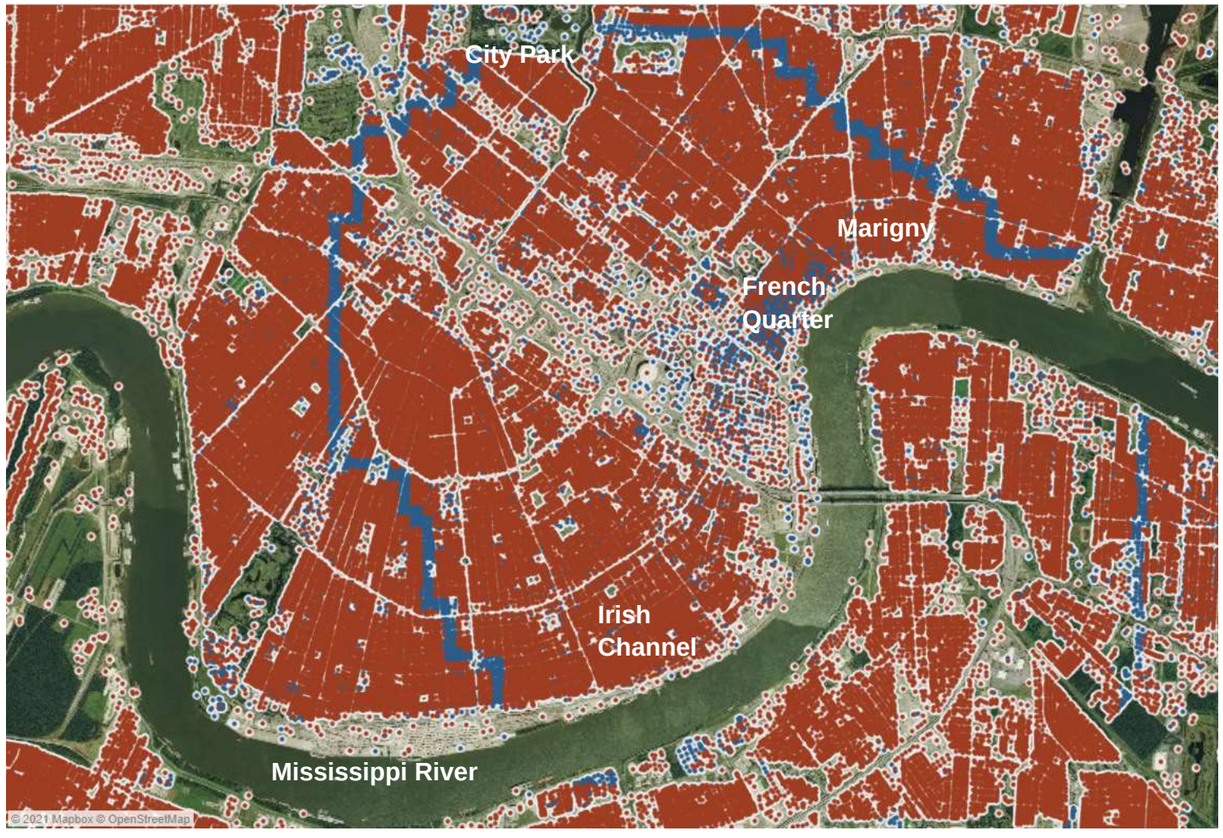
STRUCTURE INVENTORY

STRUCTURE INVENTORY

PARCEL-LEVEL AND STRUCTURE-LEVEL DATA SOURCES

- Structure-Level Data Sources
  - Google Street View/Microsoft Building Footprints (polygons)
  - Open Street Map Building Footprints (polygons)
  - National Structure Inventory (points)

- Parcel-Level Data Sources
  - CoreLogic parcels (point and polygon)
  - ATTOM (points)
  - Dun & Bradstreet businesses (points)



Microsoft (red points) and Open Street Map (blue points) in Orleans Parish – note gaps filled in by OSM

STRUCTURE INVENTORY

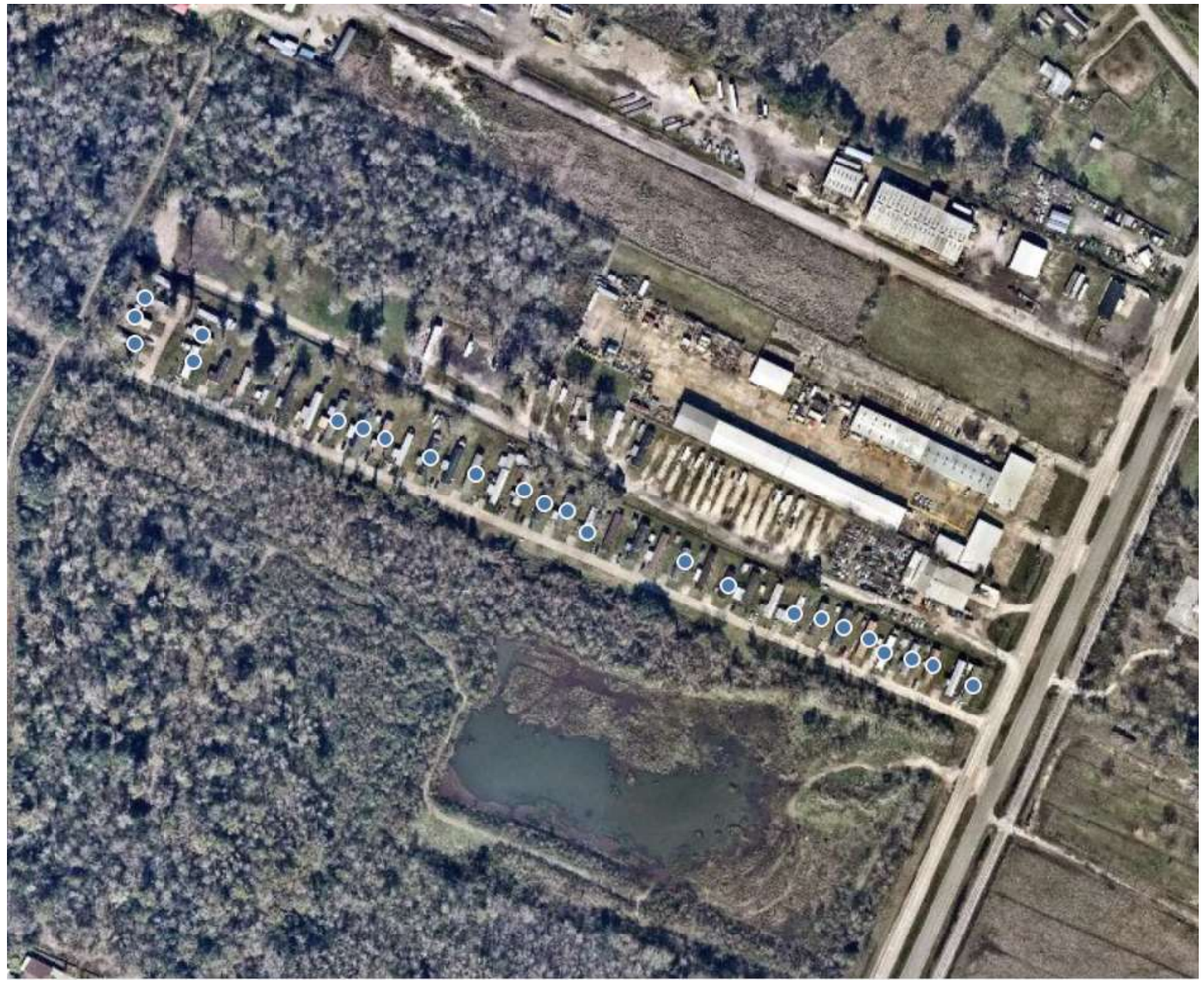
GENERAL AVAILABILITY AND PRECEDENCE

	Google Street View / Microsoft Building Footprints	National Structure Inventory	ATTOM Assessor Data	Dun & Bradstreet
Structure Features				
Geolocated Address	X			
Census Data			X	
Latitude/Longitude	X			
Foundation Type, Height, and Footprint	X	X		
Total Area of Building			X	
Number of Stories	X			
Damage Estimation				
General Building Stock Code		X		
Property Land Use			X	
NAICS6 Code				X
Assessed and Market Valuations			X	

STRUCTURE INVENTORY

SCRIPTED WORKFLOW

- Google Street View / Microsoft Building Footprints best source of structure locations
- Spatial join other three data sets after filtering (i.e., remove vacant lots, boats)
- Remove null and duplicative joins
- Address match and proximity match additional records
- Export concatenated table
- Additional QA and post-processing



Common issue: manufactured housing or camp parcels with unassigned use

STRUCTURE INVENTORY

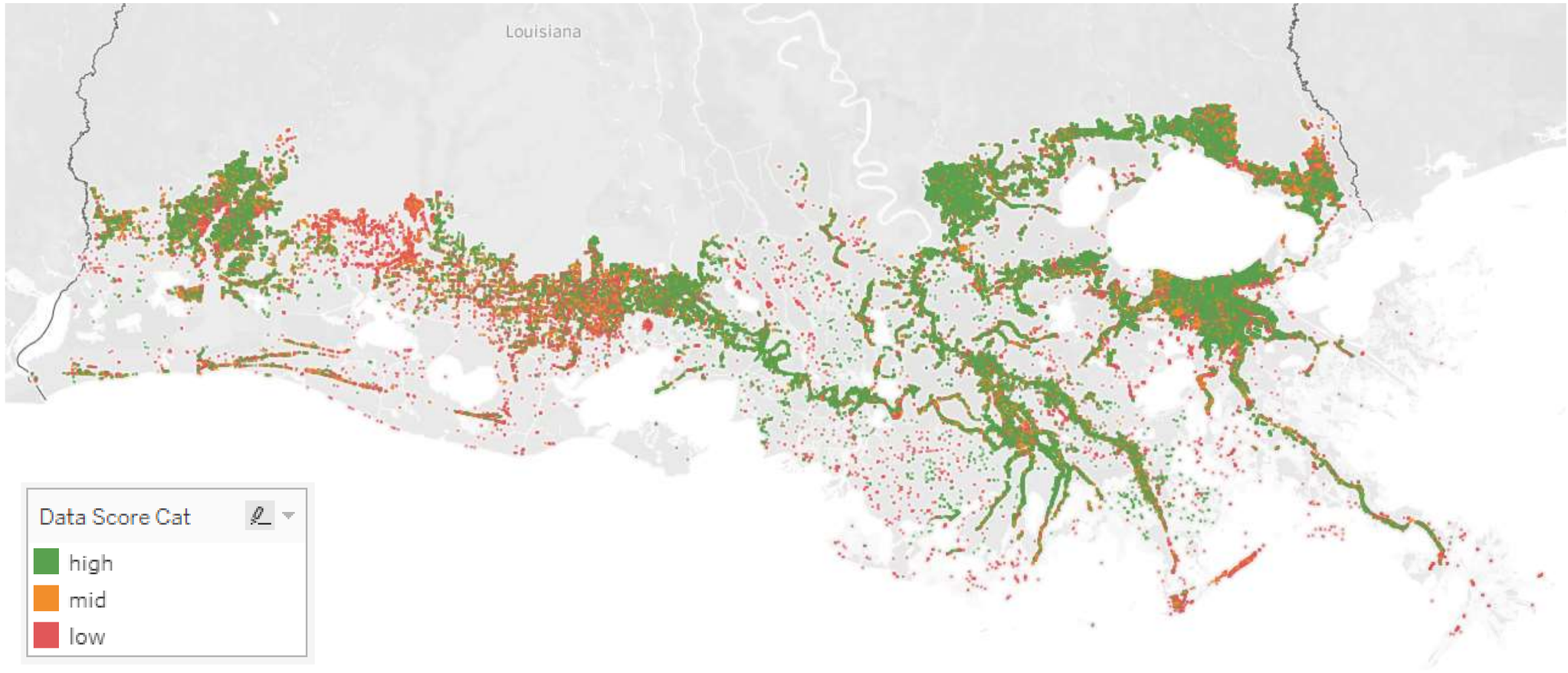
QA/QC AND SCORING

- Matching score
  - CoreLogic Parcel Match (3)
  - Exact Address Match (2) - only possible for DNB and ATTOM
  - 15m Proximity Match (1)
  - GSV only (0)
- Data presence score
  - 3 points for all DNB, ATTOM, and NSI
  - 2 points for two
  - 1 point for one
  - 0 for GSV only (or OSM)
- Data quality score
  - DNB (3)
  - ATTOM (2)
  - NSI (1)
  - GSV interpolation (0)
- Overall score (sum)
  - High quality: > 5
  - Medium quality: 3-5
  - Low quality: < 3

STRUCTURE INVENTORY

WORKFLOW RESULTS

- Starting set: **812,992** structures
- After merge, match, and QA steps: **811,871** structures



Data quality across the model domain is generally high (80% of structures), especially in built-up areas. Lower scores generally reflect lack of reliable parcel data in certain parishes/regions.

STRUCTURE INVENTORY

ASSIGNING DEPTH-DAMAGE CURVES

- Depth-damage curve assigned by GBS code
- Script assigned curve to **91%** of structures
- Remainder were addressed via QA
  - Largest structures: manual assignment
  - Others: assigned generic curve based on square footage thresholds

Use Code	Typical Use	No. of Structures	% of Total Structures	Total Ground Square Feet	% of Total Ground Square Footage
AGR1	Agriculture	3,082	0.4%	10,113,201	0.4%
COM1	Retail	33,151	4.1%	276,542,896	11.9%
COM2	Warehouse	6,036	0.7%	71,108,087	3.1%
COM3	Personal & Repair Services	1,077	0.1%	9,740,994	0.4%
COM4	Prof/Tech Services	4,408	0.5%	50,299,595	2.2%
COM5	Bank	137	0.0%	1,168,343	0.1%
COM6	Hospital	222	0.0%	8,478,744	0.4%
COM7	Medical Office	1,904	0.2%	13,044,640	0.6%
COM8	Entertainment/Recreation	2,812	0.3%	24,192,733	1.0%
COM9	Theatre	351	0.0%	4,138,981	0.2%
COM10	Garage	495	0.1%	3,206,789	0.1%
EDU1	Elementary School	1,585	0.2%	36,652,404	1.6%
EDU2	College	307	0.0%	5,723,458	0.2%
GOV1	Government Facility	1,033	0.1%	12,084,984	0.5%
GOV2	Emergency Response	177	0.0%	1,384,782	0.1%
IND1	Heavy Industrial	2,981	0.4%	11,144,982	0.5%
IND2	Light Industrial	3,580	0.4%	43,713,257	1.9%
IND3	Food/Drug/Chemical	4,234	0.5%	30,473,539	1.3%
IND4	Metals/Minerals	730	0.1%	10,876,009	0.5%
IND5	High Technology	90	0.0%	3,486,586	0.1%
IND6	Construction	629	0.1%	5,330,431	0.2%
REL1	Church or Civic Association	2,324	0.3%	17,483,725	0.8%
RES1	Single Family Home	621,029	76.5%	1,427,214,555	61.3%
RES2	Mobile Home	67,004	8.3%	90,344,203	3.9%
RES3	Apartment or Condominium	51,315	6.3%	148,351,556	6.4%
RES4	Hotel and Motel	666	0.1%	8,085,803	0.3%
RES5	Institutional Home	430	0.1%	3,122,641	0.1%
RES6	Nursing Home	82	0.0%	1,923,135	0.1%
Total		**811,871**		**2,329,431,052**	**2,329,431,052**
*Structures Removed in QAQC		1,121	0.1%	26,388,675	1.1%

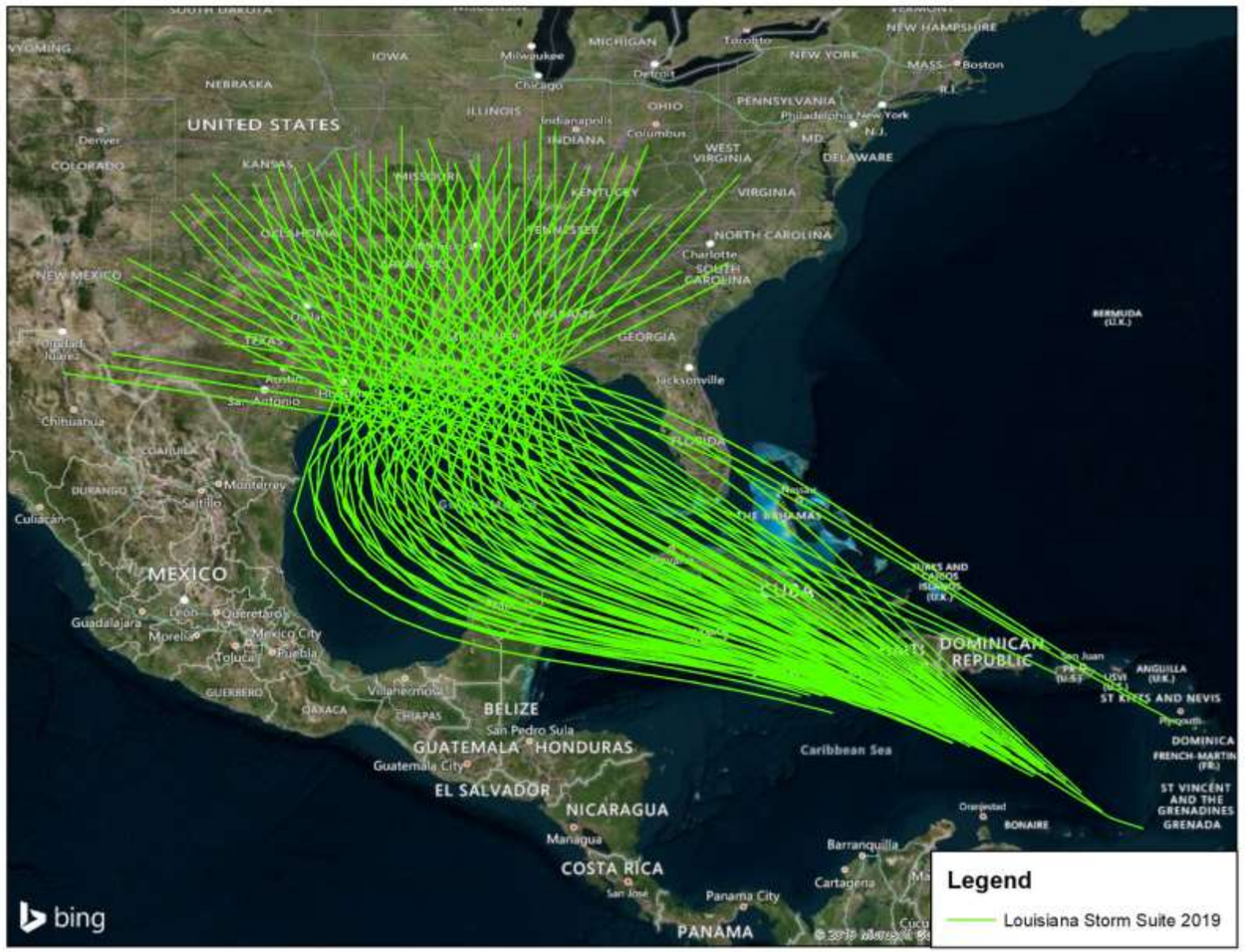
Final summary of structure inventory by GBS code

JPM-OS METHODOLOGY

HAZARD CHARACTERIZATION

UPDATES TO JPM-OS METHODOLOGY

- Transitioned from 446-storm suite to 645 synthetic storms
  - 865 to 1005 millibars c_p
  - 60 km track spacing
- More variation in r_{max} and v_f
- Historic record augmented to impute missing values of r_{max} and c_p for some storms
- Added a linear drift term for c_p
- r_{max} now fit to log-normal

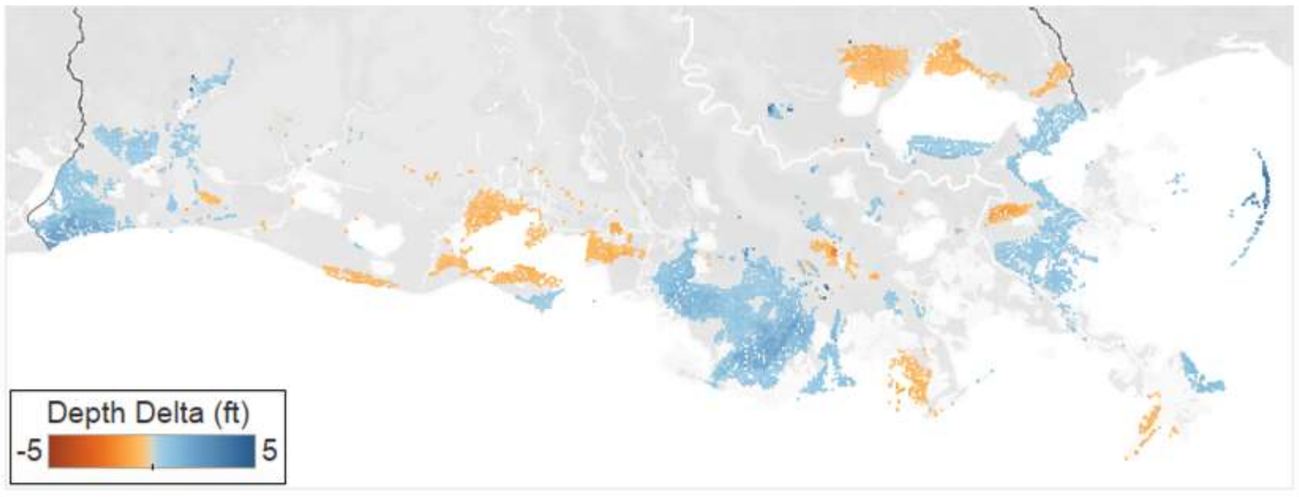


Updated synthetic storm tracks for 645-storm suite

STORM SELECTION

COASTWIDE COMPARISON OF RECOMMENDED SET TO FULL SUITE

- For 2023, statistics based on 90 storms per case
- No systematic bias or clear spatial patterns of bias relative to 645-storm suite
  - Differences less than 0.5 ft not shown
- Root mean squared error (RMSE) over all unenclosed grid points considerably smaller than 2017 storm selection



Difference in 100-year surge depths (CLARA 2023, 90 storms minus 645 storms)

Return Period	
10-Year	0.28
50-Year	0.36
100-Year	0.43
500-Year	0.64

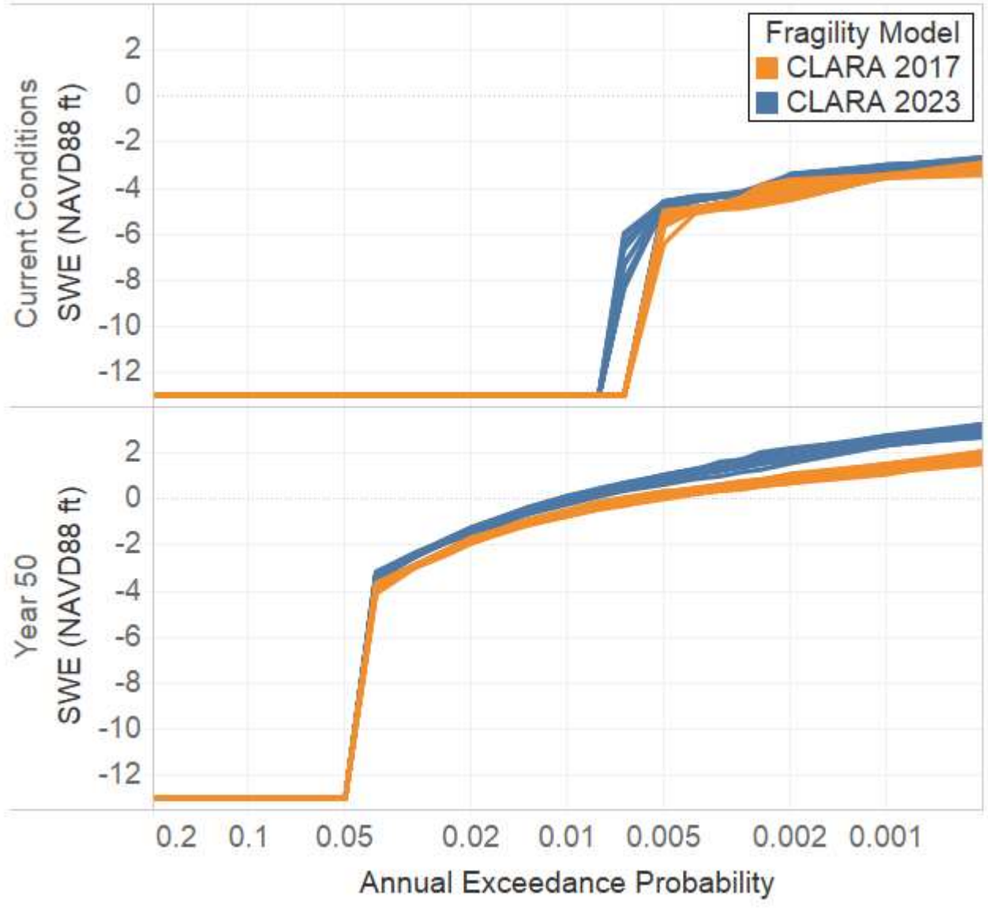
RMSE (ft) over all unenclosed grid points

SYSTEM FRAGILITY

CONSEQUENCES OF SYSTEM FAILURES

UPDATES TO SYSTEM FRAGILITY MODEL

- Previous versions of CLARA only modeled system breaches at the time of peak surge
- New methodology allows for the possibility of failures at any time during surge runup
  - Expected to produce modest but noticeable increase in risk



Stillwater elevation (SWE) exceedances for the Larose to Golden Meadow Hurricane Protection Project in 2015 (top) and 2065 (bottom), under fragility assumptions from the 2017 (orange) and 2023 (blue) Coastal Master Plans

POPULATION AND ASSET GROWTH

CHANGES TO POPULATION AND ECONOMIC ASSETS

PARAMETRIC UNCERTAINTY APPROACH

- Population change projected at the block group level
- Most assets change in direct proportion to population change
- If growth is positive:
  - Calculate number of new structures by grid point and type
  - Assign attributes by sampling the existing empirical distribution
- If growth is negative:
  - Randomly remove appropriate number of assets by grid point

Census block groups in Houma, Louisiana

THANK YOU